IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES
Attorney Docket № 13940US02 (BU 2546.1)

In re Application of:

Scott S. McDaniel

Serial No.: 10/643,331

Filing Date: August 19, 2003

For: A SYSTEM AND METHOD FOR TRANSFERRING DATA OVER A REMOTE DIRECT MEMORY ACCESS (RDMA) NETWORK

Examiner: BELANI, KISHIN G

Group Art Unit No.: 2443

Confirmation No.: 3987

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APPEAL BRIEF

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Commissioner for Patents
P.O. Box 1450
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Sir:

This is an appeal from an Office Action dated April 19, 2010 ("Final Office Action"), in which claims 1-25 were finally rejected. The Appellant respectfully requests that the Board of Patent Appeals and Interferences ("Board") reverses the final rejection of claims 1-25 of the present application. The Appellant notes that this Appeal Brief is timely filed within the two-month period for reply that ends on **September 27, 2010**.

REAL PARTY IN INTEREST
(37 C.F.R. § 41.37(c)(1)(i))

Broadcom Corporation, a corporation organized under the laws of the state of California, and having a place of business at 5300 California Avenue, Irvine, California 92617, has acquired the entire right, title and interest in and to the invention, the application, and any and all patents to be obtained therefor, as set forth in the Assignment recorded at Reel 014168, Frame 0600 in the PTO Assignment Search room.

RELATED APPEALS AND INTERFERENCES
(37 C.F.R. § 41.37(c)(1)(ii))

The Appellant is unaware of any related appeals or interferences.

STATUS OF THE CLAIMS
(37 C.F.R. § 41.37(c)(1)(iii))

Claims 1-25 were finally rejected in the Final Office Action mailed April 19, 2010. Pending claims 1-25 are the subject of this appeal.

The present application includes claims 1-25, which are pending in the present application. Claims 1-5, 10 and 16 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,790,804, by Osborne. *See* Final Office Action at pages 2-6.

Claims 6-9, 11 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 6,304,910, by Roach et al. *See* Final Office Action at pages 7-14.

Claims 12-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 6,304,910, by Roach et al., and further in view of U.S. Patent No. 6,421,742, by Tillier. *See* Final Office Action at pages 14-16.

Claim 17 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya. *See* Final Office Action at pages 16-18.

Claims 18, 20 and 22-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya, and further in view of U.S. Patent No. 6,421,742, by Tillier. *See* Final Office Action at pages 18-20.

Claim 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya, further in view of U.S. Patent No. 6,421,742, by Tillier, and still further in view of U.S. Patent No. 6,304,910, by Roach et al. *See* Final Office Action at pages 20-21.

Claim 21 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by

Pandya, further in view of U.S. Patent No. 6,421,742, by Tillier, and still further in view of U.S. Patent No. 5,991,797, by Futral et al. *See* Final Office Action at pages 21-22.

Claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya, and further in view of U.S. Patent No. 6,304,910, by Roach et al. *See* Final Office Action at pages 23-26.

The Appellant identifies claims 1-25 as the claims that are being appealed. The text of the pending claims is provided in the Claims Appendix.

STATUS OF AMENDMENTS
(37 C.F.R. § 41.37(c)(1)(iv))

The Appellant has not amended any claims subsequent to the final rejection of claims 1-25 mailed on April 19, 2010.

SUMMARY OF CLAIMED SUBJECT MATTER
(37 C.F.R. § 41.37(c)(1)(v))

Independent claim 1 recites the following:

A system for transferring data over a remote direct memory access (RDMA) network,[1] comprising:

a host comprising a driver and a network interface card (NIC), the driver being coupled to the NIC,[2]

[1] *See* present application, *e.g.,* at page 7, line 4; Figure 1 (10, 90); Figure 4.
[2] *See id., e.g.,* at page 7, lines 4-6; Figure 1 (30, 40).

wherein a one-shot initiation process of an RDMA operation is performed between the driver and the NIC of the host, the one-shot initiation process comprising communicating a single command message comprising:

buffer command information, and

a write command to write a send command.[3]

Claims 2-16 are dependent upon claim 1.

Independent claim 17 recites the following:

A system for transferring data over a remote direct memory access (RDMA) network,[4] comprising:

a host comprising a driver and a network interface card (NIC), the driver being coupled to the NIC,[5]

wherein a one-shot completion process of an RDMA operation is performed between the driver and the NIC of the host, the one-shot completion process comprising communicating a single completion message comprising:

a send complete indication, and

buffer freeing status information.[6]

Claims 18-23 are dependent upon claim 17.

Independent claim 24 recites the following:

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[3] *See id., e.g.,* at page 7, lines 6-7; page 11, lines 4-11; page 14, line 26 – page 15, line 4; Figure 1 (10, 30, 40); Figure 4 (500).
[4] *See* present application, *e.g.,* at page 7, lines 8-9; Figure 1 (10, 90); Figure 4.
[5] *See id., e.g.,* at page 7, lines 9-11; Figure 1 (30, 40).
[6] *See id., e.g.,* at page 7, lines 11-12; page 13, lines 3-14; page 15, lines 5-8; Figure 1 (10, 30, 40); Figure 4 (610).

A method for transferring data over an RDMA network,[7] comprising:

initiating an RDMA write operation using a one-shot initiation process between a driver and a NIC of a host, wherein the one-shot initiation process comprises communicating a single command message comprising:

buffer command information comprising commands to insert and validate an STag value, and

a write command to write an RDMA send message;[8]

inserting the STag value in a first field of a DDP or RDMA header of the RDMA send message;[9] and

validating the STag value in the first field with a bit flag or other specified value in a second field of the DDP or RDMA header.[10]

Independent claim 25 recites the following:

A method for transferring data over an RDMA network,[11] comprising:

completing an RDMA write operation using a one-shot completion process between a NIC and a driver of a host, wherein the one-shot completion process comprises communicating a single completion message comprising:

a send complete indication,

buffer freeing status information, and

an STag value;[12]

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[7] *See* present application, *e.g.,* at page 7, lines 13-14; Figure 1 (10, 90); Figure 4.
[8] *See id., e.g.,* at page 7, lines 15-16; page 11, lines 4-11; page 14, line 26 – page 15, line 4; Figure 1 (10, 30, 40); Figure 4 (500).
[9] *See id., e.g.,* at page 7, lines 16-17; page 10, line 26 – page 11, line 3; page 11, line 29 – page 12, line 2; page 12, lines 26-27; page 13, lines 21-23; page 14, lines 1-3, 10-12 and 17-19; page 15, lines 2-3; Figure 4 (515); Figure 5A; Figure 5B.
[10] *See id., e.g.,* at page 7, lines 17-20; page 11, line 29 – page 12, line 2; page 12, lines 26-27; page 13, lines 24-27; page 14, lines 1-3 and 12-19; Figure 4 (515); Figure 5A; Figure 5B.
[11] *See* present application, *e.g.,* at page 7, lines 21-22; Figure 1 (10, 90); Figure 4.
[12] *See id., e.g.,* at page 7, lines 23-24; page 13, lines 3-9; page 15, lines 5-8; Figure 1 (10, 30, 40); Figure 4 (610).

receiving the single completion message;[13]

identifying the STag value in a first field of a header of the single completion message;[14] and

validating the STag value in the first field of the header by identifying a bit flag or other specified value in a second field of the header.[15]

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL (37 C.F.R. § 41.37(c)(1)(vi))

Claims 1-5, 10 and 16 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,790,804, by Osborne. *See* Final Office Action at pages 2-6.

Claims 6-9, 11 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 6,304,910, by Roach et al. *See* Final Office Action at pages 7-14.

Claims 12-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 6,304,910, by Roach et al., and further in view of U.S. Patent No. 6,421,742, by Tillier. *See* Final Office Action at pages 14-16.

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[13] *See id., e.g.,* at page 7, line 24; page 13, lines 9-14; Figure 1 (10, 30, 40); Figure 4 (620).
[14] *See id., e.g.,* at page 7, lines 16-17; page 10, line 26 – page 11, line 3; page 11, line 29 – page 12, line 2; page 12, lines 26-27; page 13, lines 9-14 and 21-23; page 14, lines 1-3, 10-12 and 17-19; page 15, lines 2-3; Figure 4 (620); Figure 5A; Figure 5B.
[15] *See id., e.g.,* at page 7, lines 17-20; page 11, line 29 – page 12, line 2; page 12, lines 26-27; page 13, lines 9-14 and 24-27; page 14, lines 1-3 and 12-19; Figure 4 (620); Figure 5A; Figure 5B.

Claim 17 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya. *See* Final Office Action at pages 16-18.

Claims 18, 20 and 22-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya, and further in view of U.S. Patent No. 6,421,742, by Tillier. *See* Final Office Action at pages 18-20.

Claim 19 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya, further in view of U.S. Patent No. 6,421,742, by Tillier, and still further in view of U.S. Patent No. 6,304,910, by Roach et al. *See* Final Office Action at pages 20-21.

Claim 21 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya, further in view of U.S. Patent No. 6,421,742, by Tillier, and still further in view of U.S. Patent No. 5,991,797, by Futral et al. *See* Final Office Action at pages 21-22.

Claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,790,804, by Osborne, in view of U.S. Patent No. 7,376,755, by Pandya, and further in view of U.S. Patent No. 6,304,910, by Roach et al. *See* Final Office Action at pages 23-26.

ARGUMENT
(37 C.F.R. § 41.37(c)(1)(vii))

In the Final Office Action, claims 1-5, 10 and 16 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Osborne. Claims 6-9, 11-15 and 17-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over various combinations of Osborne, Roach, Tillier, Pandya and/or Futral.

I. Claims 1-5, 10 and 16 Are Not Anticipated by Osborne

Claims 1-5, 10 and 16 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Osborne.

A. Rejection of Independent Claim 1

The Appellant turns to the rejection of claim 1 under 35 U.S.C. § 102(b) as being anticipated by Osborne. The Appellant submits that Osborne does not disclose or suggest at least the limitation of "wherein a **one-shot initiation process** of an RDMA operation is **performed between the driver and the NIC of the host**, **the one-shot initiation process comprising communicating a single command message comprising: buffer command information, and a write command to write a send command**," as set forth in Appellant's independent claim 1.

In prior art systems, in performing an initiation process of an RDMA operation, **multiple buffer command messages** (e.g., command to register pinned down memory

buffers into a region, binding a portion of the pinned buffer to an STag value, etc.) are sent from a driver of a host to a NIC of a host.[16] Additionally, a write command instructing the NIC to write a second command is sent from a driver of a host to a NIC of a host.[17] In contrast to the prior art, Appellant's claims are directed towards a **one-shot** initiation process of an RDMA operation is **performed between the driver and the NIC of the host, the one-shot initiation process comprising communicating a single command message comprising: buffer command information, and a write command to write a send command**."

The Appellant notes that the cited references do not even describe the initiation process of an RDMA operation being performed between the driver and the NIC of the host. In the May 26, 2010 Appellant-initiated Examiner interview, the Examiner argued that an initiation process must occur and does not explicitly need to be disclosed because it is obvious (despite the rejection of independent claim 1 being under 35 U.S.C. 102(b)). However, as noted by the Appellant's representative in the interview, although an initiation process may occur in Osborne, the reference itself does not disclose the details of the initiation process and thus cannot disclose the Appellant's one-shot initiation process set forth in independent claim 1.

For example, the Final Office Action alleges that Osborne teaches the Appellant's claim limitations by Osborne's disclosure at Figures 1-2 and the supporting

[16] *See e.g.*, Appellant's Prior Art Figure 3 (270, 290) and Appellant's Specification, Paragraph [12].
[17] *See e.g.*, Appellant's Prior Art Figure 3 (310) and Appellant's Specification, Paragraph [12].

disclosure.[18] However, Osborne's Figures 1-2 and the supporting disclosure merely teach that an application 58 of sender 50 sends an operating system 56 of sender 50 a send command including a receiver ID, a source address of the message data to be sent, and a size of the data to be sent. Next, Osborne teaches that in response to the received send command, operating system 56 of sender 50 copies the message data to be sent from application memory 66 to operating system message buffers 62. Alternatively, instead of copying the message data, operating system 56 of sender 50 may map locations in application memory 66 to message buffers 62. Then, Osborne teaches that its operating system 56 performs protocol processing if necessary. Subsequently, the message is sent over a network using network interface 84.[19]

The Final Office Action alleges that Osborne's processor 54 of sender 50 is the driver and Osborne's network interface 84 of sender 50 is the NIC.[20] However, nowhere in Osborne is there any specific disclosure regarding anything being sent between Osborne's processor 54 and network interface 84, let alone that a one-shot initiation process of an RDMA operation is performed between driver and NIC of the host by communicating a single command message comprising: buffer command information, and a write command to write a send command.

Regarding Osborne's send command, the Appellant notes that Osborne's send command does not contain any buffer command information.[21] Additionally, Osborne's

[18] Final Office Action, Pages 2-4, 11-14 and 27-29.
[19] *See e.g.*, Osborne, Figures 1-2 and Column 7, Lines 14-36).
[20] Office Action, Page 3, Line 3-6 and Page 12, Lines 2-4.
[21] Osborne, Column 7, Lines 22-25.

send command is merely used by the operating system 56 to copy the message data to be sent from application memory 66 to operating system message buffers 62.[22] Nowhere in Osborne is there any disclosure regarding the send command being sent from processor 54 to network interface 84. Put another way, it is the message data copied/mapped from the application memory 66 to operating system message buffers 62 that is sent over network 82 via network interface 84, not the send command 67 sent between application 58 and operating system 56. As such, even if Osborne's send command could be considered Appellant's single command (which it clearly is not), the Appellant notes that Osborne's send command is not sent between a driver and a NIC of a host, but is instead sent between an application and an operating system.[23]

Clearly, Osborne merely teaches communicating a message from a sender 50 to a receiver 52 without disclosing any initiation process of an RDMA operation performed between the driver and the NIC of the host, let alone a one-shot initiation process.[24] Therefore, Osborne fails to disclose "wherein a **one-shot initiation process** of an RDMA operation is **performed between the driver and the NIC of the host**, **the one-shot initiation process comprising communicating a single command message comprising: buffer command information, and a write command to write a send command**," as set forth in Appellant's independent claim 1.

[22] Osborne, Figure 1 (67), Figure 2 (99, 100), Column 7, Lines 18-31.
[23] Osborne, Figure 1 (67), Figure 2 (99, 100), Column 7, Lines 18-31.
[24] *See e.g.*, Osborne, Abstract; Column 4, Lines 62-64; Column 5, Lines 14 and 24-30; Column 8, Lines 16-19, 27-33 and 63-66; Column 9, Lines 1-4, 10-11 and 33-43; and Column 10, Lines 6-7.

Accordingly, independent claim 1 is not anticipated by Osborne and is allowable. Furthermore, the Appellant reserves the right to argue additional reasons beyond those set forth herein to support the allowability of claim 1.

B. Rejection of Dependent Claims 2-5, 10 and 16

Claims 2-5, 10 and 16 depend on independent claim 1. Therefore, the Appellant submits that claims 2-5, 10 and 16 are allowable over the reference cited in the Final Office Action at least for the reasons stated above with regard to claim 1. The Appellant further submits that each of dependent claims 2-5, 10 and 16 is independently allowable.

For example, the Final Office Action alleges that "Osborne further shows and discloses the claims system wherein the driver posts the single command message to perform the one-shot initiation process (Fig. 1, processor (driver) 54 that posts the Send(ID, Source Address, Size) command 67 to Network Interface 84, by copying the command from application 1 memory 66 to message buffers 62-64 of the processor's operating system 56; Fig. 2, steps 100-104 that show the details of posting the send message to the NIC 84; column 7, lines 14-45 disclose the same details)."[25] The Appellant respectfully notes that the Final Office Action mischaracterizes Osborne's disclosure. For example, Osborne discloses that "[t]he operating system copies the message in step 100 from application memory, such as an endpoint 66, to message

[25] Final Office Action, Page 4, Lines 8-14.

buffers, e.g., 62, in the operating system 56 of sender 50."[26] The Appellant notes that copying **a send command** from application memory as alleged by the Final Office Action is different than copying **message data** from application memory as disclosed in Osborne. Further, the Appellant notes that Osborne discloses that its operating system 56, not processor 54, copies the message data. Additionally, with regard to the Final Office Action's allegation that processor 54 posts the send command 67 to network interface 84, the Appellant notes that Osborne merely discloses that the network interface 84 receives the pre-formatted message data (i.e., not the Send command) and injects the message data into the network 82.[27] Further, nowhere in the Final Office Action-cited sections of Osborne is there any disclosure regarding the functions of the processor 54. In fact, only Osborne's Final Office Action-cited Figure 1 mentions processor 54. As such, Osborne clearly cannot disclose "wherein the driver posts the single command message to perform the one-shot initiation process," as recited in Appellant's dependent claim 2.

As another example, the Final Office Action alleges that Osborne's disclosure of a send command having a source address that points to the message data and mapping locations in the application memory to message buffers 62-64 teach "wherein the buffer command information comprises a command to describe pinned-down memory buffers of the host," as recited in Appellant's dependent claim 3.[28] However, mapping locations in the application memory to message buffers does not pin-down

[26] Osborne, Column 7, Lines 25-28.
[27] Osborne, Column 7, Lines 32-36, Figure 2 (104).
[28] Final Office Action, Page 4, Line 15 – Page 5, Line 3.

memory buffers. Further, a send command sent from an application to an operating system that merely includes a source address does not provide a command to described pinned-down memory buffers of the host and is not sent between a driver and a NIC of a host. As such, Osborne clearly fails to disclose "wherein the buffer command information comprises a command to describe pinned-down memory buffers of the host," as recited in Appellant's dependent claim 3.

Regarding "wherein the buffer command information comprises a command to bind a portion of the pinned-down memory buffers of the host to a steering tag (STag)," the Final Office Action again alleges that Osborne's mere disclosure of mapping locations in the application memory to locations in the message buffer teaches the Appellant's claim limitations.[29] However, as noted above and well known in the art, mapping locations in the application memory to message buffers does not pin-down memory buffers. Further, a Send command sent from an application to an operating system that merely includes a source address does not provide a command to bind a portion of the pinned-down memory buffers of the host to a steering tag (STag). In fact, nowhere in Osborne are steering tags disclosed. As such, Osborne clearly fails to disclose "wherein the buffer command information comprises a command to bind a portion of the pinned-down memory buffers of the host to a steering tag (STag)," as recited in Appellant's dependent claim 4.

[29] Final Office Action, Page 5, Lines 4-12.

Also, the Final Office Action alleges that Osborne's disclosure of a send command 67 that merely includes a receiver ID and a source address and size of the message data to be sent teaches an RDMA send message.[30] However, as one of ordinary skill in the art would readily be able to understand, a send message including a receiver ID and a source address and size of message data does not teach an RDMA send message. Further, Osborne's teaching that DMA can be used in the receiver does not teach that a send message in a sender is an RDMA send message. In fact, nowhere in Osborne is there any mention of "remote direct memory access" or "RDMA." As such, Osborne clearly fails to disclose "wherein the send command is an RDMA send message," as recited in Appellant's dependent claim 5.

Additionally, the Final Office Action alleges that Osborne's disclosure of a network interface card capable of performing DMA operations teaches an RDMA-enabled NIC.[31] However, performing DMA operations within a receiver does not disclose performing RDMA operations across a network. Further, nowhere in Osborne is there any mention of "remote direct memory access" or "RDMA." As such, Osborne clearly fails to disclose "wherein the NIC comprises an RDMA-enabled NIC," as recited in Appellant's dependent claim 16.

Accordingly, the Appellant submits that claims 2-5, 10 and 16 are allowable over the reference cited in the Final Office Action at least for the above reasons. The

[30] Final Office Action, Page 5, Lines 13-19.
[31] Page 6, Lines 10-13.

Appellant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 2-5, 10 and 16.

II. Claims 6-9, 11 and 24 Are Not Obvious Over Osborne in view of Roach

Claims 6-9, 11 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Osborne in view of Roach.

A. Rejection of Independent Claim 24

The Appellant turns to the rejection of claim 24 under 35 U.S.C. § 103(a) as being unpatentable over Osborne in view of Roach. The Appellant submits that the combination of Osborne and Roach does not disclose or suggest at least the limitations of "initiating an RDMA write operation using **a one-shot initiation process between a driver and a NIC** of a host, wherein **the one-shot initiation process comprises communicating a single command message comprising: buffer command information comprising commands to insert and validate an STag value, and a write command to write an RDMA send message**," "inserting the **STag value** in a first field of a **DDP or RDMA header** of the RDMA send message," and "validating the **STag value** in the first field with a bit flag or other specified value in a second field of the **DDP or RDMA header**," as set forth in Appellant's independent claim 24.

As discussed above with regard to Appellant's independent claim 1, in prior art systems, in performing an initiation process of an RDMA operation, **multiple buffer command messages** (e.g., command to register pinned down memory buffers into a region, binding a portion of the pinned buffer to an STag value, etc.) are sent from a driver of a host to a NIC of a host.[32] Additionally, a write command instructing the NIC to write a second command is sent from a driver of a host to a NIC of a host.[33] In contrast to the prior art, Appellant's claims are directed towards "initiating an RDMA write operation using **a one-shot initiation process between a driver and a NIC of a host**, wherein **the one-shot initiation process comprises communicating a single command message comprising: buffer command information comprising commands to insert and validate an STag value, and a write command to write an RDMA send message**."

The Appellant notes that the cited references do not even describe the initiation process of an RDMA operation being performed between the driver and the NIC of the host. In the May 26, 2010 Appellant-initiated Examiner interview, the Examiner argued that an initiation process must occur and does not explicitly need to be disclosed because it is obvious. However, as noted by the Appellant's representative in the interview, although an initiation process may occur in Osborne, the reference itself does not disclose the details of the initiation process and thus cannot disclose the Appellant's one-shot initiation process set forth in independent claim 24.

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[32] *See e.g.*, Appellant's Prior Art Figure 3 (270, 290) and Appellant's Specification, Paragraph [12].
[33] *See e.g.*, Appellant's Prior Art Figure 3 (310) and Appellant's Specification, Paragraph [12].

For example, the Final Office Action alleges that Osborne teaches the Appellant's claim limitations by Osborne's disclosure at Figures 1-2 and the supporting disclosure.[34] However, Osborne's Figures 1-2 and the supporting disclosure merely teach that an application 58 of sender 50 sends an operating system 56 of sender 50 a send command including a receiver ID, a source address of the message data to be sent, and a size of the data to be sent. Next, Osborne teaches that in response to the received send command, operating system 56 of sender 50 copies the message data to be sent from application memory 66 to operating system message buffers 62. Alternatively, instead of copying the message data, operating system 56 of sender 50 may map locations in application memory 66 to message buffers 62. Then, Osborne teaches that its operating system 56 performs protocol processing if necessary. Subsequently, the message is sent over a network using network interface 84.[35]

The Final Office Action alleges that Osborne's processor 54 of sender 50 is the driver and Osborne's network interface 84 of sender 50 is the NIC.[36] However, nowhere in Osborne is there any specific disclosure regarding anything being sent between Osborne's processor 54 and network interface 84, let alone initiating an RDMA write operation using **a one-shot initiation process between a driver and a NIC of a host**, wherein **the one-shot initiation process comprises communicating a single command message comprising: buffer command information comprising**

[34] Final Office Action, Page 11, Line 13 – Page 13, Line 5.
[35] *See e.g.*, Osborne, Figures 1-2 and Column 7, Lines 14-36.
[36] Final Office Action, Page 3, Line 3-6 and Page 12, Lines 2-4.

commands to insert and validate an STag value, and a write command to write an RDMA send message.

Regarding Osborne's send command, the Appellant notes that Osborne's send command does not contain any buffer command information.[37] The Final Office Action alleges that Osborne's source address teaches a steering tag (STag) but such allegation is unsupported by Osborne and that of which is well known in the art. Further, even if a source address could be considered an STag (which is clearly not the case), a source address itself is clearly not a command to insert and validate an STag value.

Also, the Final Office Action alleges that Osborne's disclosure of "a copying process to copy the send command and the associated parameters of the send command from the Application 1 buffers 66 to the operating system's message buffers 62-64, thereby disclosing a write command to write an RDMA send message" teaches "a write command to write an RDMA send message."[38] However, as noted previously, Osborne discloses that "[t]he operating system copies the message in step 100 from application memory, such as an endpoint 66, to message buffers, e.g., 62, in the operating system 56 of sender 50."[39] The Appellant notes that copying **a send command** from application memory as alleged by the Final Office Action is different than copying **message data** from application memory as disclosed in Osborne. Put

[37] Osborne, Column 7, Lines 22-25.
[38] Final Office Action, Page 13, Lines 2-5.
[39] Osborne, Column 7, Lines 25-28.

another way, Osborne's teaching of a send command sent between an application and a operating system of a host including a receiver ID, source address, and message size for sending message data from a sending host to a receiving host **does not teach** a single command message comprising a write command to write an RDMA send message. Rather, Osborne's send command is merely used by the operating system 56 to copy the message data to be sent from application memory 66 to operating system message buffers 62.[40]

Further, nowhere in Osborne is there any disclosure regarding the send command being sent from processor 54 to network interface 84. Put another way, it is the message data copied/mapped from the application memory 66 to operating system message buffers 62 that is sent over network 82 via network interface 84, not the send command 67 sent between application 58 and operating system 56. As such, even if Osborne's send command could be considered Appellant's single command (which it clearly is not), the Appellant notes that Osborne's send command is not sent between a driver and a NIC of a host, but is instead sent between an application and an operating system.[41]

Roach fails to remedy the deficiencies of Osborne. Roach merely teaches placing predetermined bits indicating which is the last frame in a series of frames in a Fibre Channel frame header (FC-2 header).[42]

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[40] Osborne, Figure 1 (67), Figure 2 (99, 100), Column 7, Lines 18-31.
[41] Osborne, Figure 1 (67), Figure 2 (99, 100), Column 7, Lines 18-31.
[42] *See e.g.*, Roach, Abstract, Column 6, Lines 21-25 and Column 8, Lines 54-55.

Regarding "inserting the **STag value** in a first field of a **DDP or RDMA header** of the RDMA send message," and "validating the **STag value** in the first field with a bit flag or other specified value in a second field of the **DDP or RDMA header**," the Final Office Action acknowledges that Osborne fails to teach the Appellant's limitations; however, the Final Office Action alleges that Roach's disclosure at Figures 8-9 and Column 8, Lines 32-67 and Column 9, Lines 1-18 remedy the deficiencies of Osborne.[43]

As noted above, Roach merely teaches placing predetermined bits indicating which is the last frame in a series of frames in a Fibre Channel frame header (FC-2 header).[44] Nowhere in Roach is there any disclosure of STag values. Also, nothing in Roach teaches that the Fibre Channel frames are RDMA send messages. In fact, nowhere in Roach is there any mention of the terms "remote direct memory access" or "RDMA." Further, with regard to the cited sections of Roach, Roach explicitly teaches building a Fibre Channel frame header (FC-2 header).[45] One of ordinary skill in the art would readily understand that a Fibre Channel frame header (FC-2 header) is different than an independent from DDP and RDMA headers.

As such, even if the information inserted into Roach's Fibre Channel frame header (FC-2 header) included STag values (which is clearly not disclosed by Roach), and even if Roach taught that its Fibre Channel frames were RDMA send messages (which is not disclosed by Roach), Roach would still fail to teach "inserting the STag

[43] Final Office Action, Page 13, Lines 6-19.
[44] *See e.g.*, Roach, Abstract, Column 6, Lines 21-25 and Column 8, Lines 54-55.
[45] Roach, Column 8, Lines 54-55.

value in a first field of a **DDP or RDMA header** of the RDMA send message," and "validating the STag value in the first field with a bit flag or other specified value in a second field of the **DDP or RDMA header**."

Clearly, Osborne merely teaches communicating a message from a sender 50 to a receiver 52 without disclosing any initiation process of an RDMA operation performed between the driver and the NIC of the host, let alone a one-shot initiation process,[46] and Roach merely teaches placing predetermined bits indicating which is the last frame in a series of frames in a Fibre Channel frame header (FC-2 header).[47] Therefore, the combination of Osborne and Roach fails to disclose "initiating an RDMA write operation using **a one-shot initiation process between a driver and a NIC** of a host, wherein **the one-shot initiation process comprises communicating a single command message comprising: buffer command information comprising commands to insert and validate an STag value, and a write command to write an RDMA send message**," "inserting the **STag value** in a first field of a **DDP or RDMA header** of the RDMA send message," and "validating the **STag value** in the first field with a bit flag or other specified value in a second field of the **DDP or RDMA header**," as set forth in Appellant's independent claim 24.

[46] *See e.g.*, Osborne, Abstract; Column 4, Lines 62-64; Column 5, Lines 14 and 24-30; Column 8, Lines 16-19, 27-33 and 63-66; Column 9, Lines 1-4, 10-11 and 33-43; and Column 10, Lines 6-7.
[47] *See e.g.*, Roach, Abstract, Column 6, Lines 21-25 and Column 8, Lines 54-55.

Accordingly, independent claim 24 is not unpatentable over Osborne in view of Roach and is allowable. Furthermore, the Appellant reserves the right to argue additional reasons beyond those set forth herein to support the allowability of claim 24.

B. Rejection of Dependent Claims 6-9 and 11

Claims 6-9 and 11 depend on independent claim 1, and Roach fails to make up for the previously mentioned deficiencies of Osborne. Thus, for at least the reasons stated previously with regard to claim 1, the Appellant submits that claims 6-9 and 11 are allowable over the combination of Osborne and Roach, as well. Additionally, the Appellant submits that each of claims 6-9 and 11 is independently allowable.

For example, with regard to Appellant's dependent claims 6-9, the Final Office Action acknowledges that Osborne fails to teach the Appellant's claim limitations; however, the Final Office Action alleges that Roach's disclosure at Figures 8-9, Column 8, Lines 32-67 and Column 9, Lines 1-18 remedies the deficiencies of Osborne.[48] As discussed above with regard to Appellant's independent claim 24, the Appellant notes that Roach merely teaches placing predetermined bits indicating which is the last frame in a series of frames in a Fibre Channel frame header (FC-2 header).[49] Nowhere in Roach is there any disclosure of STag values. Further, with regard to the cited sections of Roach, Roach explicitly teaches building a Fibre Channel frame header (FC-2

[48] Final Office Action, Page 8, Line 1 – Page 10, Line 20.
[49] *See e.g.*, Roach, Abstract, Column 6, Lines 21-25 and Column 8, Lines 54-55.

header).[50] One of ordinary skill in the art would readily understand that a Fibre Channel frame header (FC-2 header) is different than an independent from DDP and RDMA headers.

As such, even if the information inserted into Roach's Fibre Channel frame header (FC-2 header) included STag values (which is clearly not disclosed by Roach), Roach would still fail to teach "wherein the NIC places the STag value in an optional field **in a direct data placement DDP or RDMA header**," as recited in Appellant's dependent claim 6; "wherein the NIC encodes a value into a field **in the DDP or RDMA header** indicating that the STag value in the optional field is valid," as set forth in the Appellant's dependent claim 7; "wherein the NIC sets one or more bits in a field **in the DDP or RDMA header** indicating that the STag value in the optional field is valid" as recited in Appellant's dependent claim 8; and, "wherein the NIC sets one or more bits or encodes a value into a second field **in the DDP or RDMA header** to advertise the portion of the pinned memory buffers of the host associated with the STag," as set forth in the Appellant's dependent claim 9.

Accordingly, the Appellant submits that claims 6-9 and 11 are allowable over the references cited in the Final Office Action at least for the above reasons. The Appellant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 6-9 and 11.

[50] Roach, Column 8, Lines 54-55.

III. Claims 12-15 Are Not Obvious Over Osborne in view of Roach and further in view of Tillier

Claims 12-15 stand rejected under 35 U.S.C. §103(a) as being obvious over Osborne in view of Roach and further in view of Tillier. Claims 12-15 depend from independent claim 1, and Tillier fails to make up for the previously mentioned deficiencies of Osborne in view of Roach. Thus, for at least the reasons stated previously with regard to claim 1, the Appellant submits that claims 12-15 are allowable over the combination of Osborne, Roach and Tillier, as well. Additionally, the Appellant submits that each of claims 12-15 is independently allowable.

For example, with regard to Appellant's dependent claim 12, the Final Office Action alleges that Tillier's disclosure of "Pointer to 'A'" in Figure 8 teaches "wherein the driver allocates an STag value." However, one of ordinary skill in the art would recognize that Tillier's mere disclosure of a "Pointer to 'A'" fails to disclose an STag. In fact, nowhere in Tillier is there any mention of the terms "steering tag" and/or "STag," which are well known terms in the art. Further, Tillier's Figure 8 clearly shows that I/O unit is separate from Host. As such, Tillier's I/O units is not a driver of a host. Additionally, as also shown in Tillier's Figure 8, the "Pointer to 'A'" is provided by the host to the I/O unit. As such, even if Tillier's I/O unit was a driver of a host (which it is not), and even if Tillier's "Pointer to 'A'" could be considered an STag (which it is not), Tillier's I/O unit clearly does not allocate the pointer because Tillier's I/O unit receives the pointer from the host.

As another example, the Final Office Action alleges that Roach's disclosure of put and get pointers for managing a command ring teach "wherein the STag value is returned synchronously from a command call." However, Roach's disclosure of incrementing pointers in a command base register that tracks when commands are queued to the command ring and read from the command ring does not teach synchronously returning STag values from a command call. The Appellant notes, that as discussed above, Roach does not disclose STag values. In fact, the well known terms "steering tag" and "STag" do not even appear in Roach. Additionally, as one of ordinary skill in the art would readily understand, STag values are not incremented. As such, Roach's put and get pointers, which are incremented as commands are added to and removed from the command ring, cannot be STag values.

Accordingly, the Appellant submits that claims 12-15 are allowable over the reference cited in the Final Office Action at least for the above reasons. The Appellant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 12-15.

IV. Claim 17 Is Not Obvious Over Osborne in view of Pandya

Claim 17 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Osborne in view of Pandya.

A. Rejection of Independent Claim 17

The Appellant turns to the rejection of claim 17 under 35 U.S.C. § 103(a) as being unpatentable over Osborne in view of Pandya. The Appellant submits that the combination of Osborne and Pandya does not disclose or suggest at least the limitation of "wherein a **one-shot completion process** of an RDMA operation is **performed between the driver and the NIC of the host**, **the one-shot completion process comprising communicating a single completion message comprising: a send complete indication, and buffer freeing status information**," as set forth in Appellant's independent claim 17.

The prior art completion process of an RDMA includes **multiple completion status and completion command messages** (e.g., completion message with STag, unbind STag command, unbind completed message, unpin region command, unpin completed message, etc.) sent between a driver of a host and a NIC of a host.[51] In contrast to the prior art, Appellant's claims are directed towards a **one-shot completion process** of an RDMA operation is **performed between the driver and the NIC of the host**, **the one-shot completion process comprising communicating a single completion message comprising: a send complete indication, and buffer freeing status information**.

The Final Office Action acknowledged that Osborne fails to teach a one-shot completion process comprising communicating a single completion message

[51] *See e.g.*, Appellant's Prior Art Figure 3 (420-460) and Paragraph [14].

comprising: a send complete indication, and buffer freeing status information; however, the Final Office Action alleges that Pandya's Figure 33 and Column 13, Lines 35-48 remedy the deficiencies of Osborne.[52] The Appellant first notes that the write operation disclosed in Figure 33 is not an RDMA write. Instead, an RDMA write is disclosed, for example, in Pandya's Figure 35. Second, the Final Office Action cited Column 13, Lines 35-48 explicitly teaches that the buffers are not freed until the status of the command execution is passed onto the host SCSI layer, which releases the buffers.[53] Thus, because the buffers are not freed until after the completion message has already passed between the NIC and the driver (and up to the SCSI layer), the message between the driver and NIC cannot comprise buffer freeing status information.

Also, Pandya merely teaches sending a command completion and sense status once all the data has been transferred. As is well known in the art, sense status is merely error information, which is different than buffer freeing status information (i.e., information indicating that the buffers have been freed). As such, Pandya's mere disclosure of sending a completion message including sense status fails to teach "wherein a **one-shot completion process** of an RDMA operation is **performed between the driver and the NIC of the host, the one-shot completion process comprising communicating a single completion message comprising: a send complete indication, and buffer freeing status information**," as recited in Appellant's independent claim 17.

[52] Final Office Action, Page 17, Lines 12-22.
[53] Pandya, Column 13, Lines 35-48.

In the May 26, 2010 Appellant-initiated Examiner interview, the Examiner acknowledged that the cited references failed to teach a single completion message sent between the driver and the NIC of the host comprising buffer freeing status information. Rather, the Examiner acknowledged that the sections of the Pandya reference cited by the Examiner merely disclose a message indicating the data transfer is complete is sent from the target to the initiator and that the completion message is passed up to the host SCSI layer where the message is processed and the buffers being used are released.[54] However, the Examiner indicated that a NIC would not pass buffer freeing status information to the driver with the send complete indication (as recited in independent claims 17 and 25) because the NIC cannot free buffers. In other words, despite acknowledging that the cited references failed to teach the claim limitations, the Examiner argued that the claims were not allowable because they were allegedly inoperable, irrespective of the claim limitations being completely supported by the Appellant's specification. Because the Examiner explicitly acknowledged that the cited references fail to teach the claim limitations in Appellant's independent claims 17 and 25, the Appellant notes that rejection of Appellant's independent claims 17 and 25 under 35 U.S.C. §103(a) are inappropriate.

Further, the Final Office Action alleges that Osborne's disclosure of extracting a message from the network into system message buffers at a receiver, protocol processing, and copying the message data from the system message buffers to application memory, teaches a completion process. However, as stated in MPEP

[54] Pandya, Figure 33 (step 3310) and Column 13, Lines 35-48.

2106(II)(C), "when evaluating the scope of a claim, every limitation in the claim must be considered. USPTO personnel may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered. See, e.g., *Diamond v. Diehr*, 450 U.S. 175, 188-89, 209 USPQ 1, 9 (1981) ." As such, reviewing the Appellant's independent claim 17 as a whole, it is clear that the one-shot completion process occurs after the RDMA operation has been completed because the one-shot completion process comprises communicating a single completion message comprising a send complete indication (i.e., transfer is complete), and buffer freeing status information (i.e., indication that buffers have been freed). Thus, Osborne's disclosure regarding receiving message data at a receiver and transferring the message data to application memory is wholly unrelated to a one-shot completion process of an RDMA operation.

Additionally, one of ordinary skill in the art would clearly not be motivated to combine Osborne's teaching regarding transferring data (i.e., **during** transfer **at a receiver**) with Pandya's teachings regarding forwarding a completion message received from a receiver **at the sender** to a driver at the sender **after a data transfer is complete**. Put another way, there is no suggestion to one of ordinary skill in the art to combine the cited teachings of Osborne and Pandya because the relied on teachings are wholly unrelated (i.e., Osborne's teachings **during** data transfer **at a receiver** *versus* Pandya's teachings **after** data transfer **at a sender**).

Clearly, Osborne merely teaches communicating a message from a sender 50 to a receiver 52 without disclosing any completion process of an RDMA operation performed between the driver and the NIC of the host, let alone a one-shot completion process,[55] and Pandya merely teaches communicating a message indicating that the communication session is complete up to an SCSI layer, which releases the buffers used for the data transfer.[56] Therefore, the combination of Osborne and Pandya fails to disclose "wherein a **one-shot completion process** of an RDMA operation is **performed between the driver and the NIC of the host**, **the one-shot completion process comprising communicating a single completion message comprising: a send complete indication, and buffer freeing status information**," as set forth in Appellant's independent claim 17.

Accordingly, independent claim 17 is not unpatentable over Osborne in view of Pandya and is allowable. Furthermore, the Appellant reserves the right to argue additional reasons beyond those set forth herein to support the allowability of claim 17.

V. Claims 18, 20 and 22-23 Are Not Obvious Over Osborne in view of Pandya and further in view of Tillier

Claims 18, 20 and 22-23 stand rejected under 35 U.S.C. §103(a) as being obvious over Osborne in view of Pandya and further in view of Tillier. Claims 18, 20

[55] *See e.g.*, Osborne, Abstract; Column 4, Lines 62-64; Column 5, Lines 14 and 24-30; Column 8, Lines 16-19, 27-33 and 63-66; Column 9, Lines 1-4, 10-11 and 33-43; and Column 10, Lines 6-7.
[56] Pandya, Column 13, Lines 35-48.

and 22-23 depend from independent claim 17, and Tillier fails to make up for the previously mentioned deficiencies of Osborne in view of Pandya. Thus, for at least the reasons stated previously with regard to claim 17, the Appellant submits that claims 18, 20 and 22-23 are allowable over the combination of Osborne, Pandya and Tillier, as well. Additionally, the Appellant submits that each of claims 18, 20 and 22-23 is independently allowable.

For example, the Final Office Action alleges that Tillier's disclosure of "Pointer to 'A'" in Figure 8 teaches an STag value associated with pinned memory in a remote host.[57] However, one of ordinary skill in the art would recognize that Tillier's mere disclosure of a "Pointer to 'A'" fails to teach an STag. In fact, nowhere in Tillier is there any mention of the terms "steering tag" and/or "STag," which are well known terms in the art. Further, Tillier's Figure 8 clearly shows that I/O unit is separate from Host.[58] As such, Tillier's I/O unit is not a NIC of a host. Additionally, nothing in Tillier teaches that the data stored at the host is pinned down. As such, Tillier fails to remedy the deficiencies of Osborne in view of Pandya in that the combination of references clearly fail to teach "wherein the NIC receives a message comprising an optional field carrying a STag value, the STag value being associated with pinned memory in a remote host," as recited in Appellant's dependent claim 18.

As another example, the Final Office Action alleges that Tillier's disclosure of freeing I/O request resources in Figure 6 (604-606) teaches, wherein the NIC de-

[57] Final Office Action, Page 18, Lines 10-19.
[58] Tillier, Figure 8.

associates the STag value with the pinned memory in the host, thereby preventing further access to the pinned memory using the de-associated STag value.[59] However, nowhere in Tillier is there any mention of the terms "steering tag" and/or "STag," which are well known terms in the art. Further, even if STag values were disclosed (which is clearly not the case), nowhere in Tillier is there any teaching that the freeing of resources includes de-associating STag values from pinned-memory in the host. In fact, nothing in Tillier teaches that the data stored at the host is pinned down. Further, even if Tillier did disclose STag values (which Tillier does not), did disclose pinned memory (which Tillier does not) and did disclose de-associating STag values from the pinned memory in the host (which Tillier does not), Tillier still fails to teach that a NIC performs the de-association. As such, Tillier fails to remedy the deficiencies of Osborne in view of Pandya in that the combination of references clearly fails to teach "wherein the NIC de-associates the STag value with the pinned memory in the host, thereby preventing further access to the pinned memory using the de-associated STag value," as recited in Appellant's dependent claim 20.

Also, the Final Office Action alleges that Tillier's disclosure of freeing I/O request resources in Figure 6 (604-606) and a cleanup routine in Figure 7B teaches, wherein the NIC de-associates the STag value with previously associated SGL information.[60] However, nowhere in Tillier is there any mention of the terms "steering tag" and/or "STag," which are well known terms in the art. Further, even if STag values were

[59] Final Office Action, Page 19, Lines 7-14.
[60] Final Office Action, Page 19, Lines 15-20.

disclosed (which is clearly not the case), nowhere in Tillier is there any teaching that the freeing of resources includes de-associating STag values from SGL information. Additionally, even if Tillier did disclose STag values (which Tillier does not) and did disclose de-associating STag values from SGL information (which Tillier does not), Tillier still fails to teach that a NIC performs the de-association. As such, Tillier cannot remedy the deficiencies of Osborne in view of Pandya in that the combination of references clearly fails to teach "wherein the NIC de-associates the STag value with previously associated SGL information," as recited in Appellant's dependent claim 22.

Additionally, the Final Office Action alleges that Tillier's disclosure of freeing I/O request resources in Figure 6 (604-606) and a cleanup routine in Figure 7B teaches, wherein the NIC frees any resources dedicated to information regarding the pinned memory.[61] However, nowhere in Tillier is there any teaching that the freeing of resources includes freeing resources dedicated to information regarding the pinned-memory. In fact, nothing in Tillier teaches that the data stored at the host is pinned down. Further, even if Tillier did disclose pinned memory (which Tillier does not) and did disclose freeing resources dedicated to information regarding the pinned memory (which Tillier does not), Tillier still fails to teach that a NIC performs the freeing of resources. As such, Tillier fails to remedy the deficiencies of Osborne in view of Pandya in that the combination of references clearly fails to teach "wherein the NIC frees any resources dedicated to information regarding the pinned memory," as recited in Appellant's dependent claim 23.

[61] Final Office Action, Page 20, Lines 1-5.

Accordingly, the Appellant submits that claims 18, 20 and 22-23 are allowable over the reference cited in the Final Office Action at least for the above reasons. The Appellant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claims 18, 20 and 22-23.

VI. Claim 19 Is Not Obvious Over Osborne in view of Pandya, in further view of Tillier, and still further in view of Roach

Claim 19 stands rejected under 35 U.S.C. §103(a) as being obvious over Osborne in view of Pandya, in further view of Tillier, and still further in view of Roach. Claim 19 depends from independent claim 17, and Tillier in view of Roach fails to make up for the previously mentioned deficiencies of Osborne in view of Pandya. Thus, for at least the reasons stated previously with regard to claim 17, the Appellant submits that claim 19 is allowable over the combination of Osborne, Pandya, Tillier and Roach, as well. Additionally, the Appellant submits that claim 19 is independently allowable.

Accordingly, the Appellant submits that claim 19 is allowable over the reference cited in the Final Office Action at least for the above reasons. The Appellant also reserves the right to argue additional reasons beyond those set forth above to support the allowability of claim 19.

VII. Claim 21 Is Not Obvious Over Osborne in view of Pandya, in further view of Tillier, and still further in view of Futral

Claim 21 stands rejected under 35 U.S.C. §103(a) as being obvious over Osborne in view of Pandya, in further view of Tillier, and still further in view of Futral. Claim 21 depends from independent claim 17, and Tillier in view of Futral fails to make up for the previously mentioned deficiencies of Osborne in view of Pandya. Thus, for at least the reasons stated previously with regard to claim 17, the Appellant submits that claim 21 is allowable over the combination of Osborne, Pandya, Tillier and Futral, as well. Additionally, the Appellant submits that claim 21 is independently allowable.

For example, the Final Office Action alleges that Futral's disclosure of chain pointers within a SGL teaches "wherein the driver compares the STag value received with a STag value previously sent." However, as is known in the art, STag values may be associated with SGLs; however, chain pointers within SGLs are not STag values. Further, even if the chain pointers within Futral's SGLs could be considered an STag value (which is clearly not the case), nothing in Futral teaches comparing the chain pointers received to chain pointers previously sent, let alone using a driver to make the comparison. As such, Futral fails to remedy the deficiencies of Osborne, Pandya and Tillier in that the combination of references clearly fails to teach, at least, "wherein the driver compares the STag value received with a STag value previously sent," as recited in Appellant's dependent claim 21.

Accordingly, the Appellant submits that claim 21 is allowable over the reference cited in the Final Office Action at least for the above reasons. The Appellant also

reserves the right to argue additional reasons beyond those set forth above to support the allowability of claim 21.

VIII. Claim 25 Is Not Obvious Over Osborne in view of Pandya and further in view of Roach

Claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Osborne in view of Pandya and further in view of Roach.

A. Rejection of Independent Claim 25

The Appellant turns to the rejection of claim 25 under 35 U.S.C. § 103(a) as being unpatentable over Osborne in view of Pandya and further in view of Roach. The Appellant submits that the combination of Osborne, Pandya and Roach does not disclose or suggest at least the limitations of "completing an RDMA write operation using a **one-shot completion process between a NIC and a driver of a host**, wherein **the one-shot completion process comprises communicating a single completion message comprising: a send complete indication, buffer freeing status information, and an STag value**," "identifying the STag value **in a first field of a header of the single completion message**," and "validating the STag value **in the first field of the header** by identifying a bit flag or other specified value in a second field of the header," as set forth in Appellant's independent claim 25.

As discussed above with regard to Appellant's independent claim 17, the prior art completion process of an RDMA includes **multiple completion status and completion command messages** (e.g., completion message with STag, unbind STag command, unbind completed message, unpin region command, unpin completed message, etc.) sent between a driver of a host and a NIC of a host.[62] In contrast to the prior art, Appellant's claims are directed towards completing an RDMA write operation using a **one-shot completion process between a NIC and a driver of a host**, wherein **the one-shot completion process comprises communicating a single completion message comprising: a send complete indication, buffer freeing status information, and an STag value**.

The Final Office Action acknowledged that Osborne fails to teach a one-shot completion process comprising communicating a single completion message comprising: a send complete indication, buffer freeing status information, and an STag value; however, the Final Office Action alleges that Pandya's Figure 33 and Column 13, Lines 35-48 remedy the deficiencies of Osborne.[63] The Appellant first notes that the write operation disclosed in Figure 33 is not an RDMA write. Instead, an RDMA write is disclosed, for example, in Pandya's Figure 35. Second, the Final Office Action cited Column 13, Lines 35-48 explicitly teaches that the buffers are not freed until the status of the command execution is passed onto the host SCSI layer, which releases the

[62] *See e.g.*, Appellant's Prior Art Figure 3 (420-460) and Paragraph [14].
[63] Final Office Action, Page 17, Lines 12-22.

buffers.[64] Thus, because the buffers are not freed until after the completion message has already passed between the NIC and the driver (and up to the SCSI layer), the message between the driver and NIC cannot comprise buffer freeing status information.

Also, Pandya merely teaches sending a command completion and sense status once all the data has been transferred. As is well known in the art, sense status is merely error information, which is different than buffer freeing status information (i.e., information indicating that the buffers have been freed) and an STag value. As such, Pandya's mere disclosure of sending a completion message including sense status fails to teach "completing an RDMA write operation using a **one-shot completion process between a NIC and a driver of a host**, wherein **the one-shot completion process comprises communicating a single completion message comprising: a send complete indication, buffer freeing status information, and an STag value**," as recited in Appellant's independent claim 25.

Additionally, the Final Office Action alleges that "since releasing the buffers implies knowing where in the memory the buffers are, it is implied that a pointer (STag) to the message buffers is also sent with the send complete indication." MPEP 2112-IV ("Examiner must provide rationale or evidence tending to show inherency") states the following:

> **The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.** *In re Rijckaert*, 9 F.3d 1531, 1534, 28

[64] Pandya, Column 13, Lines 35-48.

> USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that **the missing descriptive matter is necessarily present in the thing described in the reference**, and that it would be so recognized by persons of ordinary skill. **Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.' "** *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted) (The claims were drawn to a disposable diaper having three fastening elements. The reference disclosed two fastening elements that could perform the same function as the three fastening elements in the claims. The court construed the claims to require three separate elements and held that the reference did not disclose a separate third fastening element, either expressly or inherently.).[65]

The Final Office Action fails to provide rationale or evidence showing that an STag **will necessarily need to be present** in a completion message in order release buffers. Instead, one of ordinary skill in the art would readily understand that a sender, upon receiving an indication that the transfer is complete, would not necessarily need the receiver to identify which message buffers at the sender need to be released because such information about the sender message buffers would already be known by the sender. Further, even if a receiver was to provide a sender with information identifying the message buffers, such identification need not be using an STag value. Therefore, the rejection based on the Final Office Action's conclusory statement that "since releasing the buffers implies knowing where in the memory the buffers are, it is implied that a pointer (STag) to the message buffers is also sent with the send complete indication" cannot be maintained without evidence or rationale showing that an STag

[65] Manual of Patent Examining Procedure (MPEP) at § 2112.

will necessarily need to be present in a completion message in order release buffers. As such, the Appellant submits that Pandya fails to remedy the deficiencies of Osborne and Roach in that the combination of references clearly fails to teach a single completion message comprising an STag value.

In the May 26, 2010 Appellant-initiated Examiner interview, the Examiner acknowledged that the cited references failed to teach a single completion message sent between the driver and the NIC of the host comprising buffer freeing status information. Rather, the Examiner acknowledged that the sections of the Pandya reference cited by the Examiner merely disclose a message indicating the data transfer is complete is sent from the target to the initiator and that the completion message is passed up to the host SCSI layer where the message is processed and the buffers being used are released.[66] However, the Examiner indicated that a NIC would not pass buffer freeing status information to the driver with the send complete indication (as recited in independent claims 17 and 25) because the NIC cannot free buffers. In other words, despite acknowledging that the cited references failed to teach the claim limitations, the Examiner argued that the claims were not allowable because they were allegedly inoperable, irrespective of the claim limitations being completely supported by the Appellant's specification. Because the Examiner explicitly acknowledged that the cited references fail to teach the claim limitations in Appellant's independent claims 17 and 25, the Appellant notes that rejection of Appellant's independent claims 17 and 25 under 35 U.S.C. §103(a) are inappropriate.

[66] Pandya, Figure 33 (step 3310) and Column 13, Lines 35-48.

Further, the Final Office Action alleges that Osborne's disclosure of extracting a message from the network into system message buffers at a receiver, protocol processing, and copying the message data from the system message buffers to application memory, teaches a completion process. However, as stated in MPEP 2106(II)(C), "when evaluating the scope of a claim, every limitation in the claim must be considered. USPTO personnel may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered. See, e.g., *Diamond v. Diehr*, 450 U.S. 175, 188-89, 209 USPQ 1, 9 (1981) ." As such, reviewing the Appellant's independent claim 17 as a whole, it is clear that the one-shot completion process occurs after the RDMA operation has been completed because the one-shot completion process comprises communicating a single completion message comprising a send complete indication (i.e., transfer is complete), and buffer freeing status information (i.e., indication that buffers have been freed). Thus, Osborne's disclosure regarding receiving message data at a receiver and transferring the message data to application memory is wholly unrelated to a one-shot completion process of an RDMA operation.

Additionally, one of ordinary skill in the art would clearly not be motivated to combine Osborne's teaching regarding transferring data (i.e., **during** transfer **at a receiver**) with Pandya's teachings regarding forwarding a completion message received from a receiver **at the sender** to a driver at the sender **after a data transfer is complete**. Put another way, there is no suggestion to one of ordinary skill in the art to

combine the cited teachings of Osborne and Pandya as the teachings are wholly unrelated (i.e., Osborne's teachings **during** data transfer **at a receiver** *versus* Pandya's teachings **after** data transfer **at a sender**).

Regarding "identifying the STag value **in a first field of a header of the single completion message**," and "validating the STag value **in the first field of the header** by identifying a bit flag or other specified value in a second field of the header," the Final Office Action acknowledges that Osborne and Pandya fails to teach the Appellant's limitations; however, the Final Office Action alleges that Roach's disclosure at Figures 8-9 and Column 8, Lines 32-67 and Column 9, Lines 1-18 remedy the deficiencies of Osborne and Pandya.[67]

Roach merely teaches placing predetermined bits indicating which is the last frame in a series of frames in a Fibre Channel frame header (FC-2 header).[68] Nowhere in Roach is there any disclosure of STag values. Further, the Final Office Action-cited Figures 8-9 of Roach merely describe a Buffer Point List Format (Figure 9) and the Buffer Pointer List Entry Format (Figure 8) for the Buffer Point List that "must exist in contiguous physical memory."[69] In other words, Roach is wholly unrelated to identifying an STag value in a first field of a header and validating the STag value in the first field of the header by identifying a bit flag or other specified value in a second field of the

[67] Final Office Action, Page 25, Line 13 – Page 26, Line 5.
[68] *See e.g.*, Roach, Abstract, Column 6, Lines 21-25 and Column 8, Lines 54-55.
[69] Roach, Column 8, Lines 31-35.

header as alleged in the Final Office Action, and instead is related to buffer lists stored in physical memory.

Clearly, Osborne merely teaches communicating a message from a sender 50 to a receiver 52 without disclosing any completion process of an RDMA operation performed between the driver and the NIC of the host, let alone a one-shot completion process;[70] Pandya merely teaches communicating a message indicating that the communication session is complete up to an SCSI layer, which releases the buffers used for the data transfer;[71] and, Roach merely teaches placing predetermined bits indicating which is the last frame in a series of frames in a Fibre Channel frame header (FC-2 header).[72] Therefore, the combination of Osborne, Pandya and Roach at least fails to disclose "completing an RDMA write operation using a **one-shot completion process between a NIC and a driver of a host**, wherein **the one-shot completion process comprises communicating a single completion message comprising: a send complete indication, buffer freeing status information, and an STag value**," "identifying the STag value **in a first field of a header of the single completion message**," and "validating the STag value **in the first field of the header** by identifying a bit flag or other specified value in a second field of the header," as set forth in Appellant's independent claim 25.

[70] *See e.g.*, Osborne, Abstract; Column 4, Lines 62-64; Column 5, Lines 14 and 24-30; Column 8, Lines 16-19, 27-33 and 63-66; Column 9, Lines 1-4, 10-11 and 33-43; and Column 10, Lines 6-7.
[71] Pandya, Column 13, Lines 35-48.
[72] *See e.g.*, Roach, Abstract, Column 6, Lines 21-25 and Column 8, Lines 54-55.

Accordingly, independent claim 25 is not unpatentable over Osborne in view of Pandya and further in view of Roach and is allowable. Furthermore, the Appellant reserves the right to argue additional reasons beyond those set forth herein to support the allowability of claim 25.

CONCLUSION

For at least the foregoing reasons, the Appellant submits that claims 1-25 are in condition for allowance. Reversal of the Examiner's rejection and issuance of a patent on the application are therefore requested.

The Commissioner is hereby authorized to charge $540 (to cover the Brief on Appeal Fee) and any additional fees or credit any overpayment to the deposit account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

Respectfully submitted,

Date: 27-SEP-2010

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CLAIMS APPENDIX
(37 C.F.R. § 41.37(c)(1)(viii))

1. A system for transferring data over a remote direct memory access (RDMA) network, comprising:

a host comprising a driver and a network interface card (NIC), the driver being coupled to the NIC,

wherein a one-shot initiation process of an RDMA operation is performed between the driver and the NIC of the host, the one-shot initiation process comprising communicating a single command message comprising:

buffer command information, and

a write command to write a send command.

2. The system according to claim 1, wherein the driver posts the single command message to perform the one-shot initiation process.

3. The system according to claim 1, wherein the buffer command information comprises a command to describe pinned-down memory buffers of the host.

4. The system according to claim 3, wherein the buffer command information comprises a command to bind a portion of the pinned-down memory buffers of the host to a steering tag (STag).

5. The system according to claim 1, wherein the send command is an RDMA send message.

6. The system according to claim 4, wherein the NIC places the STag value in an optional field in a direct data placement DDP or RDMA header.

7. The system according to claim 6, wherein the NIC encodes a value into a field in the DDP or RDMA header indicating that the STag value in the optional field is valid.

8. The system according to claim 6, wherein the NIC sets one or more bits in a field in the DDP or RDMA header indicating that the STag value in the optional field is valid.

9. The system according to claim 6, wherein the NIC sets one or more bits or encodes a value into a second field in the DDP or RDMA header to advertise the portion of the pinned memory buffers of the host associated with the STag.

10. The system according to claim 1, wherein the buffer command information provides a description of a section of memory.

11. The system according to claim 1, wherein the single command message is posted to a command ring of the host.

12. The system according to claim 11, wherein the driver allocates an STag value.

13. The system according to claim 12, wherein the STag value is returned synchronously from a command call.

14. The system according to claim 12, wherein the STag value is saved in a driver command table of the host.

15. The system according to claim 14, wherein the STag value saved in a driver command table is associated with an application reference number.

16. The system according to claim 1, wherein the NIC comprises an RDMA-enabled NIC.

17. A system for transferring data over a remote direct memory access (RDMA) network, comprising:

a host comprising a driver and a network interface card (NIC), the driver being coupled to the NIC,

wherein a one-shot completion process of an RDMA operation is performed between the driver and the NIC of the host, the one-shot completion process comprising communicating a single completion message comprising:

a send complete indication, and

buffer freeing status information.

18. The system according to claim 17, wherein the NIC receives a message comprising an optional field carrying a STag value, the STag value being associated with pinned memory in a remote host.

19. The system according to claim 18, wherein a header of the message indicates the validity of the optional field with a bit flag or specified value in an encoded field.

20. The system according to claim 18, wherein the NIC de-associates the STag value with the pinned memory in the host, thereby preventing further access to the pinned memory using the de-associated STag value.

21. The system according to claim 18,

wherein the single completion message comprises the optional field carrying the STag value received by the NIC;

wherein the NIC delivers the single completion message to the driver, and

wherein the driver compares the STag value received with a STag value previously sent.

22. The system according to claim 18, wherein the NIC de-associates the STag value with previously associated SGL information.

23. The system according to claim 20, wherein the NIC frees any resources dedicated to information regarding the pinned memory.

24. A method for transferring data over an RDMA network, comprising:

initiating an RDMA write operation using a one-shot initiation process between a driver and a NIC of a host, wherein the one-shot initiation process comprises communicating a single command message comprising:

buffer command information comprising commands to insert and validate an STag value, and

a write command to write an RDMA send message;

inserting the STag value in a first field of a DDP or RDMA header of the RDMA send message; and

validating the STag value in the first field with a bit flag or other specified value in a second field of the DDP or RDMA header.

25. A method for transferring data over an RDMA network, comprising:

completing an RDMA write operation using a one-shot completion process between a NIC and a driver of a host, wherein the one-shot completion process comprises communicating a single completion message comprising:

a send complete indication,

buffer freeing status information, and

an STag value;

receiving the single completion message;

identifying the STag value in a first field of a header of the single completion message; and

validating the STag value in the first field of the header by identifying a bit flag or other specified value in a second field of the header.

EVIDENCE APPENDIX
(37 C.F.R. § 41.37(c)(1)(ix))

(1) United States Patent No. 5,790,804 ("Osborne"), entered into record by the Examiner in the November 13, 2009 Office Action.

(2) United States Patent No. 6,304,910 ("Roach"), entered into record by the Examiner in the June 27, 2007 Office Action.

(3) United States Patent No. 6,421,742 ("Tillier"), entered into record by the Examiner in the June 27, 2007 Office Action.

(4) United States Patent No. 7,376,755 ("Pandya"), entered into record by the Examiner in the July 14, 2008 Office Action.

(5) United States Patent No. 5,991,797 ("Futral"), entered into record by the Appellant in the March 1, 2004 Information Disclosure Statement.

RELATED PROCEEDINGS APPENDIX
(37 C.F.R. § 41.37(c)(1)(x))

The Appellant is unaware of any related appeals or interferences.